No. 12-398

In the Supreme Court of the United States

ASSOCIATION FOR MOLECULAR PATHOLOGY, ET AL.,
PETITIONERS

v.

MYRIAD GENETICS, INC., ET AL.

ON WRIT OF CERTIORARI
TO THE UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

BRIEF FOR THE UNITED STATES AS AMICUS CURIAE
IN SUPPORT OF NEITHER PARTY

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QUESTION PRESENTED

Whether human genes are patent-eligible subject matter under 35 U.S.C. 101.

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INTEREST OF THE UNITED STATES

This case presents the question whether certain human genetic materials are patent-eligible subject matter under 35 U.S.C. 101. The Court's resolution of that question will significantly affect the work of the United States Patent and Trademark Office (PTO), which is responsible for issuing patents. 35 U.S.C. 2(a)(1). The question presented is also of substantial importance to several other federal agencies, including the National Institutes of Health (NIH) and the Centers for Disease Control and Prevention.

STATEMENT

1. Section 101 of the Patent Act of 1952, 35 U.S.C. 1 *et seq.*, provides that an inventor may obtain a patent on "any new and useful process, machine, manufacture, or

composition of matter, or any new and useful improvement thereof, * * * subject to the conditions and requirements of this title." 35 U.S.C. 101. The provision thus "defines the subject matter that may be patented." *Bilski* v. *Kappos*, 130 S. Ct. 3218, 3225 (2010). Congress cast the provision "in broad terms to fulfill the constitutional and statutory goal of promoting 'the Progress of Science and the useful Arts.'" *Diamond* v. *Chakrabarty*, 447 U.S. 303, 315 (1980); see *J.E.M. Ag Supply, Inc.* v. *Pioneer Hi-Bred Int'l, Inc.*, 534 U.S. 124, 130-131 (2001).

Section 101 is subject, however, to an "important implicit exception": "[l]aws of nature, natural phenomena, and abstract ideas are not patentable." *Mayo Collaborative Servs.* v. *Prometheus Labs., Inc.*, 132 S. Ct. 1289, 1293 (2012) (citation and internal quotation marks omitted) (*Mayo*). Such "manifestations of * * * nature" are "free to all men and reserved exclusively to none." *Funk Bros. Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127, 130 (1948).

2. a. Deoxyribonucleic acid (DNA) is a molecule that encodes the instructions required by living cells to produce the proteins essential for their structure and function. Pet. App. 257a-260a. DNA directly or indirectly controls nearly every aspect of an organism's physiology. The basic structure of DNA comprises two strands of four different repeating chemical units—adenine (A), thymine (T), guanine (G), and cytosine (C)—known as "nucleotides" or "bases." *Id.* at 257a. These strands bind together and twist into a distinctive double helix. *Id.* at 258a. The four standard nucleotides are chemically paired such that cytosine always binds with guanine, and adenine with thymine. *Ibid.* Because of the predictable way in which nucleotides pair, it is possible to

infer from a nucleotide sequence on one strand of DNA the corresponding nucleotide sequence with which it may bind. *Ibid*. Likewise, it is possible to infer from the nucleotide sequence of a DNA molecule the structure of the corresponding protein that the DNA segment "encodes," *i.e*., instructs the cell to build. *Ibid.*

An organism's complete set of DNA is its "genome." Pet. App. 259a n.6. With qualifications not relevant here, a "gene" is any section of DNA that, through its nucleotide sequence, governs the expression of a particular protein. *Id.* at 258a. Only certain portions of a gene's nucleotide sequence, known as "exons," code for the protein that the gene expresses. *Ibid.* The remaining portions of the gene include non-protein-coding regulatory regions governing the manner and timing of a cell's protein production, as well as non-coding intervening sequences known as "introns." *Ibid.*

b. Within a human body, DNA ("native DNA") is packaged into chromosomes and bound with chromosomal proteins. Pet. App. 262a. DNA can be extracted from its cellular environment through "any number of well-established laboratory techniques." *Id*. at 263a. A particular DNA segment of interest, such as a gene, can then be excised from the extracted material. The result of this laboratory process—a DNA molecule excised from the genome and separated from its cellular environment—is commonly termed "isolated DNA." See, *e.g.*, J.A. 755 (U.S. Patent No. 5,747,282, col. 19, lines 8-18 (filed May 5, 1998) ('282 patent)). Once a DNA segment has been isolated, it can be studied and exploited in a laboratory. For instance, isolated DNA can be used as diagnostic tools that target and bind to particular DNA segments—"probes"—and as aids in sequencing

and reproducing DNA—"primers." See Pet. App. 264a-265a.

Scientists can also manufacture a variety of artificial DNA molecules that alter or recombine raw genetic materials in new and useful ways. For example, "complementary DNA" (cDNA) molecules are synthetic molecules built by scientists to include, in a single contiguous DNA segment, only the exons of a naturally occurring gene, without the introns and regulatory regions that are normally interspersed with exon sequences in genomic DNA. See Pet. App. 267a-269a. cDNA molecules are synthesized by taking advantage of the process by which DNA directs the creation of protein in a cell. During that process, the DNA double helix unzips, and a new molecule, ribonucleic acid (RNA), is formed by an enzyme that copies the now-single strand of DNA, matching the strand's nucleotides with complementary nucleotides. The introns are then spliced out of the RNA molecule, and the exons are joined in a contiguous strand, leaving a molecule known as "messenger RNA," or "mRNA." *Id.* at 266a. When this process occurs within a cell, the mRNA then provides instructions "for the assembly of a protein." *Id.* at 267a.

In order to create cDNA, scientists use mRNA for a different purpose: to generate a new DNA molecule that contains nucleotide sequences complementary to the mRNA's nucleotides. The resulting cDNA molecule includes the same exon sequences present in the original DNA strand but lacks the DNA's intron and regulatory sequences. Pet. App. 268a-269a. Because they contain protein-coding nucleotides in uninterrupted form, cDNAs have a variety of uses. For instance, they can be inserted into a cell in order to cause it to express a protein of interest. *Id.* at 269a.

3. Since the early 1980s, the PTO has issued patents on a wide range of engineered DNA molecules and useful genetic methods. In 1982, the PTO began to issue patents that claimed cDNA molecules in combination with other genetic material. See, *e.g.*, U.S. Patent No. 4,322,499 (filed Mar. 30, 1982). In subsequent years, the PTO began to grant patents directed to isolated DNA.

In 2001, in responding to public comments on proposed revised examination guidelines concerning the "utility" requirement of 35 U.S.C. 101, the PTO issued its only written articulation of its views on isolated DNA patents. See Utility Examination Guidelines, 66 Fed. Reg. 1092 (Jan. 5, 2001). The PTO stated that if the patent discloses a particular use for a gene—*e.g.*, expressing a useful protein—then "an inventor's discovery of a gene can be the basis for a patent on the genetic composition isolated from its natural state." *Id.* at 1093. The PTO explained that a DNA molecule that has been "isolated" in this way is not a product of nature "because that DNA molecule does not occur in that isolated form in nature." *Ibid.*

4. a. In 2009, petitioners, a group of medical researchers, associations, and patients, filed this action challenging 15 claims drawn from seven United States patents owned by, or exclusively licensed to, respondents.[1] The patents relate to the human genes known as Breast Cancer Susceptibility Genes 1 and 2, or

[1] Petitioners named the PTO as a defendant with respect to constitutional claims, but not with respect to the statutory claims at issue in this Court. The district court dismissed the claims against the PTO, Pet. App. 355a-357a, and petitioners did not appeal that ruling. The United States participated as amicus curiae in the court of appeals. As in this brief, the United States argued in the Federal Circuit that cDNA is patent-eligible but that isolated DNA is not.

"BRCA1" and "BRCA2."[2] See generally Pet. App. 297a-310a. Mutations in these genes are associated with significantly increased risks of breast and ovarian cancer. *Id.* at 379a-380a.

Several of the composition claims in the patents-in-suit, including claim 2 of the '282 patent, are limited to cDNAs that encode the BRCA proteins. See Pet. App. 426a. Other claims at issue would encompass isolated but otherwise unmodified human genomic DNA. For instance, claim 1 of the '282 patent claims "[a]n isolated DNA coding for a BRCA1 polypeptide," or protein, "said polypeptide having the amino acid sequence set forth in SEQ ID NO:2." *Id.* at 298a. "SEQ ID NO:2" describes the amino-acid sequence of the BRCA1 protein as it occurs in nature. See J.A. 755 (col. 19, lines 41-50). The specification defines the term "isolated DNA" to include, as relevant here, both cDNAs and genomic DNA that has been "separated from other cellular components which naturally accompany a native human sequence" and "removed from its naturally occurring environment." *Ibid.* (col. 19, lines 8-18). Accordingly, claim 1 of the '282 patent encompasses any isolated DNA molecule that codes for the natural BRCA1 protein—including an ordinary BRCA gene isolated from a tissue sample taken from any patient.

b. The district court held that petitioners had standing to challenge respondents' patents, Pet. App. 392a-412a; that all of the challenged composition claims were invalid because they were directed to patent-ineligible products of nature, *id.* at 232a-357a; and that the challenged method claims were also invalid, *id.* at 344a-355a.

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[2] The United States is a co-owner of four of the patents-in-suit. Pet. App. 377a n.4. In 1995, the government granted an exclusive license under those patents to respondent Myriad.

5. a. A divided panel of the Federal Circuit reversed in relevant part and remanded. Pet. App. 120a-231a. The court of appeals unanimously held that the district court had declaratory-judgment jurisdiction because "at least one" petitioner, Dr. Ostrer, had standing. *Id.* at 9a, 28a-41a, 148a-158a. The court unanimously held that cDNA molecules are patent-eligible. *Id.* at 169a, 192a-193a, 225a. A majority of the panel also concluded that isolated DNA is patent-eligible. *Id.* at 159a-172a; *id.* at 193a-212a (Moore, J., concurring).[3]

b. Petitioners filed a petition for a writ of certiorari (No. 11-725). While that petition was pending, this Court issued its decision in *Mayo*, *supra*. *Mayo* concerned diagnostic method claims that "purport[ed] to apply" what this Court characterized as "natural laws describing the relationships between" the blood concentration of certain metabolites and appropriate drug dosage. 132 S. Ct. at 1294. This Court held that the method claims were invalid because they did not contain elements "sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the natural law itself." *Ibid.* The Court then granted the petition in No. 11-725, vacated the court of appeals' judgment, and remanded for further proceedings in light of *Mayo*. *Id.* at 1794.

6. On remand, the same panel reaffirmed its earlier conclusions, principally for the same reasons it had previously given. Pet. App. 1a-119a. The court held that certain of the challenged claims were limited to cDNA molecules, and that such molecules are patent-eligible because they are synthesized by scientists. *Id.* at 47a n.9, 54a, 80a-81a, 113a-114a. Judges Lourie and

[3] The court of appeals also held that all but one of respondents' method claims were invalid. Pet. App. 62a-70a, 172a-179a.

Moore concluded that isolated DNA is patent-eligible, each offering different reasons for that conclusion. Judge Bryson dissented from that holding.

Judge Lourie reasoned that isolated genes "are markedly different—have a distinctive chemical structure and identity—from those found in nature." Pet. App. 50a-51a. He explained that separating DNA from the human body entails breaking chemical bonds, and that the separated "portion [of DNA] never exists as a separate molecule in the body or anywhere else in nature, and may have an entirely different utility." *Id.* at 57a. Judge Lourie also invoked the "longstanding practice of the PTO," noting that "Congress has not indicated that the PTO's position is inconsistent with [Section] 101." *Id.* at 62a.

Judge Moore did not join Judge Lourie's opinion with respect to isolated DNA, but instead concurred in the judgment. Pet. App. 73a-96a. In her view, isolated DNA could be patent-eligible only if, in addition to the chemical differences highlighted by Judge Lourie, isolated DNA had greater utility than native DNA. *Id.* at 82a-83a. She concluded that shorter isolated DNA segments had the necessary additional utility because they could be used as primers and probes. *Id.* at 83a-84a. Judge Moore viewed "longer strands of isolated DNA" as presenting a closer question because those strands do not clearly involve increased utility "as compared to nature." *Id.* at 85a-86a. She ultimately concluded, however, that the court should not disturb the "settled expectations" and "extensive property rights" engendered by the PTO's practice of allowing patents on such sequences. *Id.* at 86a.

Judge Bryson dissented, concluding that isolated DNA is not patent-eligible. Pet. App. 98a-119a. In his

view, *Mayo* suggested that "[i]n cases such as this one, in which the applicant claims a composition of matter that is nearly identical to a product of nature, it is appropriate to ask whether the applicant has done 'enough' to distinguish his alleged invention from the similar product of nature." *Id.* at 112a. Judge Bryson would have held that isolated DNA did not satisfy that standard because "[t]he only material change made to those genes from their natural state is the change that is necessarily incidental to the extraction of the genes from the environment in which they are found in nature." *Id.* at 102a. Judge Bryson also disagreed with the majority's reliance on the PTO's practice of issuing isolated DNA patents and the "expectations of the inventing community." *Id.* at 119a. He explained that such considerations could not override the rule against patenting products of nature. *Ibid.*

SUMMARY OF ARGUMENT

Synthesized genetic materials such as cDNA are patent-eligible subject matter because they do not occur in nature but instead are the product of significant human creativity. By contrast, isolated but otherwise unmodified DNA is not patent-eligible. The public's ability to study and use native DNA would be unduly compromised if changes caused by the extraction of naturally-occurring substances from their native environments were sufficient to trigger patent-eligibility. And while the process of isolating DNA entails physical changes, those changes do not significantly alter the structure or function of the relevant DNA segments.

A. Under this Court's longstanding precedents, laws and products of nature cannot be patented. That is so even if significant effort and creativity are required to discover the natural law or substance and to appreciate

its potential utility. A patent may be issued for a modified natural substance if the modified version is sufficiently different from its naturally occurring antecedent and the other statutory requirements for patentability are satisfied. In deciding whether a particular modified substance is patent-eligible under these standards, a court should ask, *inter alia*, whether issuance of a patent would have the practical effect of preempting all use of the underlying natural substance.

B. Artificial DNA molecules such as cDNAs are patent-eligible inventions. Creating cDNA requires significant manipulation and alteration of naturally occurring genetic materials rather than simply the extraction of those materials from their native environment. Issuing patents on cDNA creates no risk of preempting other uses of the raw materials from which cDNA is created.

C. Isolated but otherwise unmodified genomic DNA is not patent-eligible. In their naturally occurring state—*i.e.*, as a portion of a larger native strand within a cell, which in turn is located within the human body—the DNA molecules claimed in respondents' patents are products of nature. The process of isolation does not transform those molecules into human-made inventions.

As with many naturally occurring substances, the process of "isolating" a particular DNA segment changes the molecule's physical structure to a degree (since the ends of the segment must be "snipped" in order to remove it from the cell of which it is a part) and increases its utility (since isolation allows researchers to study and exploit it in a laboratory). Those changes, however, are simply inherent consequences of removing the original substance from its natural environment. Since isolation is a prerequisite to meaningful productive use of native DNA, treating such changes as sufficient to sup-

port patent-eligibility would effectively preempt the public's use of the underlying product of nature.

Congress's failure to amend the Patent Act to foreclose the patenting of isolated DNA does not imply congressional approval of such patents. Since the 1980s, the PTO has issued patents on both isolated DNA and cDNA. It was not until 2001, however, that the PTO issued its first written explanation of its view that isolated DNA is patent-eligible, and that view was not tested in court until this litigation commenced. This case is therefore unlike prior patent-law disputes where the Court has given weight to reliance interests engendered by established judicially-created doctrines.

The court of appeals also suggested that factors specific to the biotechnology industry supported a narrow view of the product-of-nature exception to patent-eligibility. This Court has eschewed that sort of industry-specific approach to patent-eligibility, preferring instead to establish general rules designed to strike an appropriate balance between competing objectives. One such rule is that patents may not be issued on products of nature, even though such products may benefit the public, and even though the availability of patents would increase the incentives for researchers to discover such substances and ascertain their useful properties. The determination whether such rules should be modified in their application to particular industries or categories of inventions has traditionally been left to Congress. And the product-of-nature exception itself serves important public purposes (including incentives for innovation), since an overbroad conception of patent-eligibility could unduly restrict the public's study and productive use of resources found in the natural world.

ARGUMENT

SYNTHESIZED GENETIC MATERIALS SUCH AS cDNA MOLECULES ARE PATENT-ELIGIBLE SUBJECT MATTER, WHILE ISOLATED BUT OTHERWISE UNMODIFIED GENOMIC DNA IS NOT

Petitioners contend that respondents' claims to cDNA molecules and to isolated but otherwise unmodified DNA are directed to patent-ineligible products of nature. In the government's view, cDNA is patent-eligible under Section 101 because it must be synthesized from other genetic materials, a process that involves significant manipulation and leaves the public free to exploit the underlying natural substances used to create cDNA. Isolated DNA, by contrast, is not patent-eligible because it has merely been "isolated"—*i.e.*, extracted from its cellular environment and separated from extraneous material—rather than significantly altered by human intervention. Because the differences between isolated and native DNA are simply the necessary consequences of removing DNA from its natural environment, and DNA must be isolated before it can be exploited, respondents' isolated DNA claims threaten to preempt the use of the underlying native DNA. See *Mayo Collaborative Servs.* v. *Prometheus Labs.*, 132 S. Ct. 1289, 1294 (2012). To prevent that result, the mere act of culling a natural product from its environment to exploit its preexisting natural qualities—however useful those qualities may be—should be treated as insufficient to create patent-eligible subject matter.

The PTO has regularly issued patents directed to isolated genomic DNA, and various government agencies have previously sought and obtained such patents. The patent-eligibility of isolated DNA was never tested in litigation, however, until petitioners filed this suit. Be-

fore the district court, the government, in the course of defending against petitioners' constitutional claims, stated that "the USPTO's position" on whether "DNA molecules" are patent-eligible "remains as set forth in its Utility Guidelines." PTO Reply Br. at 11, Docket entry No. 245, 09-cv-4515 (Jan. 29, 2010). The district court's judgment in this case, however, prompted the United States to reevaluate whether such patents are consistent with the settled principle that patent protection does not extend to products of nature. Based on that review, the United States concluded that, although the PTO has properly issued patents on cDNA and other synthesized genetic materials, isolated DNA is not patent-eligible subject matter.[4]

A. Section 101 Embraces Only "Human-Made Inventions" That Do Not Monopolize Laws Or Products Of Nature

1. Section 101 of Title 35 broadly permits an inventor to obtain a patent on "any new and useful process, machine, manufacture, or composition of matter." 35 U.S.C. 101. "[A]s a matter of statutory *stare decisis* going back 150 years," however, the provision's scope has been limited by an implicit exception under which "[l]aws of nature, natural phenomena, and abstract ideas" are not patentable. *Bilski* v. *Kappos*, 130 S. Ct. 3218, 3225 (2010); *Mayo*, 132 S. Ct. at 1293. Such manifestations of nature are "free to all men and reserved exclusively to none." *Diamond* v. *Chakrabarty*, 447 U.S.

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[4] The court of appeals correctly held that the district court had jurisdiction to adjudicate petitioners' claims. Pet. App. 25a, 32a-41a. Dr. Ostrer has standing to challenge the validity of respondents' patents because his research activities are constrained by respondents' assertion of their rights under allegedly invalid patents. See *Already, LLC* v. *Nike*, No. 11-982 (Jan. 9, 2013), slip op. 5; *MedImmune, Inc*. v. *Genentech, Inc.*, 549 U. S. 118, 126-137 (2007).

303, 309 (1980) (citation omitted). Thus, "a new mineral discovered in the earth or a new plant found in the wild is not patentable subject matter," even though the discovery and acquisition of the mineral or plant, and the identification of its useful properties, may have required significant effort and ingenuity. *Ibid.*; see, *e.g.*, *Diamond* v. *Diehr*, 450 U.S. 175, 185-186 (1981).

The Court has recognized, however, that "all inventions at some level embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract ideas." *Mayo*, 132 S. Ct. at 1293. While one cannot patent a "new plant found in the wild," *Chakrabarty*, 447 U.S. at 309, modifications of plant substances found in nature, as well as new plants bred from existing ones, may be patent-eligible. See *J.E.M. Ag Supply Inc.* v. *Pioneer Hi-bred Int'l, Inc.*, 534 U.S. 124, 130-131, 134 (2001) (*J.E.M. Ag Supply*). The patent-eligibility of a modified natural substance depends on whether the modified substance is so "markedly" different from its natural predecessor as to warrant the conclusion that the claimant has invented something new. *Chakrabarty*, 447 U.S. at 309-310; cf. *Mayo*, 132 S. Ct. at 1302 (process claim that "add[ed] nothing of significance to the natural laws themselves" was invalid).

2. This Court has twice considered whether a substance derived from nature falls within the product-of-nature exception to Section 101. In *Chakrabarty*, the Court held that a genetically engineered microorganism useful for digesting oil spills was patent-eligible because it had "*markedly different* characteristics from any found in nature and [had] the potential for significant utility." 447 U.S. at 309-310 (emphasis added). The inventor had altered a naturally occurring bacterium by transferring to it several plasmids that altered the bac-

terium's structure and imbued it with the ability to break down crude oil—a "property[] which [was] possessed by no naturally occurring bacteria." *Id.* at 305. It was the "markedly different" characteristics of the modified substance that made it useful. The Court therefore concluded that the patentee's "discovery is not nature's handiwork, but his own; accordingly it is patentable subject matter under [Section] 101." *Id.* at 310.

By contrast, in *Funk Brothers Seed Co.* v. *Kalo Inoculant Co.*, 333 U.S. 127 (1948), the Court held that natural strains of root-nodule bacteria were not patent-eligible. The patentee had "discovered that there existed in nature certain species of root-nodule bacteria which did not exert a mutually inhibitive effect on each other." *Chakrabarty*, 447 U.S. at 310. He accordingly created a mixed culture containing several such species, which could be used to inoculate the seeds of several different types of plants at once. *Ibid.*; see *Funk Brothers*, 333 U.S. at 130. The Court emphasized that, although the patentee had discovered the bacteria strains' natural properties, he had not altered the bacteria in any way. *Id.* at 131. In addition, although the bacteria within the mixed culture had applications that single strains did not—in that the culture could be used to inoculate multiple types of plants at once—the Court emphasized that, within the culture, the unaltered "bacteria perform[ed] in their natural way." *Ibid.*

Chakrabarty and *Funk Brothers* thus establish that, although an inventor may not obtain a patent merely by discovering the existence or useful properties of a natural substance, patents may be issued on new substances created out of naturally occurring raw materials. *Chakrabarty*, 447 U.S. at 310; *Funk Brothers*, 333 U.S. at 131. Since *Chakrabarty*, however, the Court has not

had occasion to further elaborate on the nature or extent of the modifications that may be sufficient to warrant the conclusion that a substance derived from a natural product is sufficiently different from nature to be considered a man-made invention.

3. Although this Court's decision in *Mayo* concerned process rather than composition claims, it provides useful guidance for determining whether particular modifications to a naturally occurring substance are sufficient to render the modified substance patent-eligible.

In *Mayo*, the Court addressed a therapeutic method patent based on the correlation between patient metabolite levels after administering a drug and the likely safety and efficacy of that drug. 132 S. Ct. at 1294. The Court held that the patent was invalid because the correlation was a law of nature and the patent posed a risk of "disproportionately tying up" its future uses. *Ibid.* The Court explained that the "basic underlying concern" of the natural-law exception to Section 101 is that patentees must not be allowed, through "drafting effort[s]," to "monopolize the law of nature itself." *Id.* at 1297, 1302. When a claimed process is centered on a natural law, the method as a whole therefore must "contain other elements * * * sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the natural law itself." *Id.* at 1294; see, *e.g.*, *id.* at 1301.

Not every nuance of *Mayo*'s process-claim analysis applies directly to patents directed to compositions of matter. The law-of-nature and product-of-nature exceptions to Section 101 do, however, reflect the same basic principle: a person should not receive a

patent for simply discovering the existence and useful properties of something that already exists in nature. See *Chakrabarty*, 447 U.S. at 309 (both plants in the wild and mathematical laws are "manifestations of . . . nature") (citation omitted). A composition claim that effectively prevents the public from studying and using a *product* of nature is just as objectionable as a method claim that prevents the public from studying and exploiting a *law* of nature.

Mayo thus suggests that, in determining whether a modified natural product is "markedly different" from the underlying natural substance and therefore patent-eligible, one relevant question is whether a patent on the modified product would have the practical effect of preempting the public's ability to use the underlying natural substance. If so, then the differences between the claimed invention and the underlying natural substance are not sufficient to render the composition patent-eligible. See 132 S. Ct. at 1294. This inquiry into preemptive effect is not an exclusive test of the patent-eligibility of a product derived from nature. The patent at issue in *Funk Brothers*, 333 U.S. at 130, for example, was held invalid even though it would not have prevented exploitation of any single strain of bacteria. But *Mayo* indicates that, at a minimum, a substance derived from a product of nature should not be considered patent-eligible if the patent would have the effect of preempting all uses of the underlying natural substance.

In particular, extending patent eligibility to a modified natural substance may risk "tying up" the underlying natural substance when the differences between the modified and original substances consist of nothing more than the necessary consequences of remov-

ing the substance from its natural environment. Removing a product of nature from its natural surroundings is often a prerequisite to any serious study or commercial exploitation of that product. When that is so, and the act of removal would necessarily result in the creation of a patented composition, the patent risks preempting all future uses of the natural product. It therefore does not "in practice amount[] to significantly more than a patent on the natural [product] itself." *Mayo*, 132 S. Ct. at 1294.

B. Artificial DNA Molecules, Including cDNAs, Are Human-Made Inventions Eligible For Patent Protection

cDNA molecules are synthesized nucleotide sequences that contain only the exons of a naturally occurring gene. With exceptions not relevant here (such as retroviruses that use cDNA-like structures to replicate themselves), cDNA molecules generally do not occur in nature, either in isolation or as contiguous sequences contained within longer natural molecules. Pet. App. 268a. To create cDNA, a scientist therefore does not simply remove existing cDNA from its natural environment. Rather, scientists must synthesize cDNA from other genetic materials, a process that involves significant manipulation of the underlying natural substances to create a substance that is new and different. See p. 4, *supra*. The resulting cDNA molecule has a different nucleotide sequence than DNA created naturally within the cell, and (because it lacks introns) it is "preferable" to isolated DNA for many laboratory uses. See Bruce Alberts et al., *Molecular Biology of the Cell* 504 (Garland Science 4th ed. 2002).

Extending patent protection to cDNAs therefore poses no risk of "tying up" other uses of the natural raw materials involved in the creation of cDNA. *Mayo*, 132

S. Ct. at 1294. A patent on a particular cDNA molecule leaves others free to study and exploit the original native DNA, RNA, and mRNA molecules that were used to create the cDNA. Those substances can be removed from their cellular environment and studied without creating the patented cDNA molecule, and they can be altered in ways that do not result in the creation of the cDNA. cDNA is thus analogous to the genetically modified bacterium in *Chakrabarty*. Upholding the patent on that bacterium did not prevent others from investigating or experimenting upon the original, naturally occurring micro-organism. See 447 U.S. at 310.

Petitioners contend (Br. 49-53) that cDNAs are not patent-eligible because they contain the same protein-coding information—*i.e.*, exon sequences—as DNA in the body. But the properties of any product originally derived from nature, including the bacterium in *Chakrabarty*, can be traced to the operation of natural principles. While the coding properties of cDNA molecules' exons are determined by nature, those properties operate within a molecule (a DNA strand with the regulatory and intron regions spliced out) that does not exist in nature and that has increased utility relative to naturally occurring genetic materials or isolated but unmodified DNA. The fact that a cDNA incorporates nucleotide sequences whose significance is derived from nature therefore does not mean that the molecule as a whole is a product of nature.[5] See *Diehr*, 450 U.S. at 187.

[5] It is possible that, given the prevailing level of knowledge in biotechnological fields, future patent applications directed to cDNAs and other synthesized DNA molecules may be rejected as obvious. 35 U.S.C 103; see *In re Kubin*, 561 F.3d 1351, 1358-1361 (Fed. Cir. 2009).

C. Isolated But Otherwise Unmodified Genomic DNA Is Not Patent-Eligible

Respondents' claims directed to isolated DNA are invalid under Section 101. Isolated DNA is simply naturally occurring DNA that has been extracted from its cellular environment and separated from extraneous material. The differences between isolated DNA and native DNA within a cell are merely the inherent and necessary results of removing the DNA from its natural environment. Because the removal process is a prerequisite to any exploitation of native DNA, respondents' isolated DNA claims are the practical equivalent of patents on the underlying naturally occurring BRCA genes themselves.

1. Isolated DNA is not markedly different from native DNA

a. Respondents' composition claims are directed to "isolated" DNA molecules that have been extracted from their natural cellular environment and excised from other portions of the gene. Absent the "isolated" limitation, claim 1 of the '282 patent, for example, would encompass the native BRCA1 gene in the human body, which "cod[es] for a BRCA1 polypeptide."[6] Pet. App. 426a. In their pre-isolation form—*i.e.*, as a portion of a larger native gene within a cell—the BRCA sequences clearly are products of nature. Independent of any

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[6] Several of the disputed claims, including claim 1 of the '282 patent, are framed in functional terms that would additionally encompass non-naturally occurring variations of the BRCA genes and related cDNAs. But because the challenged claims in respondents' patents encompass the isolated natural gene as well, they are invalid under Section 101. See *Titanium Metals Corp.* v. *Banner*, 778 F.2d 775, 782 (Fed. Cir. 1985).

human intervention, BRCA genes exist within the human genome and, together with the rest of the genome and other materials, are packaged into chromosomes within each cell. *Id.* at 262a. Also independent of human intervention, the unique nucleotide sequence of BRCA genes induces human cells to express the BRCA1 protein, and certain mutations in that sequence are associated with an increased risk of cancer.

As the court of appeals recognized, the process of excising a selected portion of DNA from its cellular environment results in a molecule that is distinct from native DNA in certain respects. Pet. App. 51a-52a; see *id.* at 308a-309a. The isolated DNA segment is structurally different from native DNA, in that each end of the isolated DNA segment is no longer bonded to the rest of the gene. *Id.* at 51a-52a. Within the isolated DNA segment, however, the nucleotide sequence (which contains both the protein-coding exons and non-coding sequences) is unchanged. *Id.* at 20a.

Although isolated DNA has applications that native DNA does not, that is a consequence of the fact that DNA, once isolated, can be manipulated by scientists in a laboratory. Isolated DNA can be sequenced and analyzed. Shorter isolated strands may also be used, with some modifications, as probes, which are used to target and bind to a particular DNA segment, and primers, which can be used to help determine the order of nucleotides in a DNA molecule. Pet. App. 264a-265a, 269a-270a. All of these applications depend on the fact that isolated DNA's nucleotide sequence is identical to that of the same gene segment as it exists within a cell, so that the isolated DNA binds with the same complementary nucleotide sequences as it would in non-isolated form. *Ibid.*

b. These distinctions between isolated and native DNA do not render isolated DNA "markedly different" from native DNA.

The structural difference between isolated DNA and native DNA—the isolated segment's "snipped" ends—has no functional consequences. That truncation does not alter any of the operative properties of the isolated DNA segment. In particular, the nucleotide sequence that determines the binding and coding properties of a given DNA segment is exactly the same after the segment has been isolated as it was when it existed as part of the genome in the human body. Judge Lourie viewed the fact that "[i]solated DNA has been cleaved (*i.e.*, had covalent bonds in its backbone chemically severed)" as sufficient to render isolated DNA patent-eligible. Pet. App. 51a, 53a-54a. But if a structural change that leaves the natural substance's operative properties entirely untouched were sufficient in itself to support patent-eligibility, the removal of a kidney from the body might render the extracted kidney patent-eligible.[7] *Id.* at 107a (Bryson, J., dissenting).

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[7] Judge Lourie emphasized that the distinct structure of isolated DNA manifests itself at the molecular level. Pet. App. 51a-52a, 54a-55a, 57a. But there is no sound reason that "it should make a difference, for purposes of patentability, whether the isolated substance is part of a single molecule * * * or part of a very large aggregation of molecules, as in the case of a kidney." *Id.* at 107a (Bryson, J., dissenting); cf. *Mayo*, 132 S. Ct. at 1303 (refusing to distinguish between narrow and broad natural laws for patent-eligibility purposes). Judge Lourie also concluded that isolated DNA, unlike an extracted kidney, warrants patent protection because isolating DNA requires "extensive research" and skill. Pet. App. 60a. That reasoning conflates the patent-eligibility of the extraction method with that of the resulting isolated substance. The process of extracting a segment of DNA (now well understood in the art) was undoubtedly patent-

The fact that isolated DNA has additional applications likewise does not render it markedly different from native DNA. The "additional utility" on which the concurring judge below relied (Pet. App. 82a-84a) is simply the ability of researchers to study and exploit in a laboratory the inherent natural properties that isolated DNA shares with native DNA. For two of the composition claims at issue here, the relevant compositions of matter are defined by the natural biological function they perform in the human body: the capacity to express BRCA1 and BRCA2 proteins. See *id.* at 426a-427a.

Indeed, the isolated gene is important to respondents and the medical community precisely because isolated DNA operates in exactly the same way in a laboratory as it does in its natural environment. Thus, human manipulation has resulted only in an increased ability to exploit the DNA segment's natural properties, rather than in increased utility arising from altered properties. In this respect as well, isolated DNA is analogous to a kidney removed from the body or a plant obtained from the wild, and is unlike the modified bacterium in *Chakrabarty*, which had additional utility arising from the non-natural properties created by human intervention.

These differences between isolated and native DNA cannot render isolated DNA patent-eligible. "The only material change made to [isolated] genes from their natural state is the change that is necessarily incidental to the extraction of the genes from the environment in which they are found in nature." Pet. App. 102a

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eligible when it was first conceived. But the effort required to discover or obtain a naturally occurring substance does not make that substance patent-eligible. See *Funk Brothers*, 333 U.S. at 131.

(Bryson, J., dissenting). That isolation process is generally a prerequisite to any serious study or exploitation of the underlying native DNA.[8] See, *e.g.*, *Principles and Techniques of Biochemistry and Molecular Biology* 164 (Keith Wilson & John Walker, eds., 7th ed. 2010); Burton E. Tropp, *Molecular Biology: Genes to Proteins* 151-152 (4th ed. 2012). Many "future use[s]" of native BRCA DNA segments therefore may infringe respondents' patents.[9] *Mayo*, 132 S. Ct. at 1302. By claiming the substance that necessarily results from removing DNA from its cellular environment—the first, necessary step in studying or further exploiting the DNA—respondents' isolated DNA claims "risk disproportionately tying up the use of the underlying natural" products. *Id.* at 1294. Respondents' claimed isolated DNA therefore is not "markedly different" from native DNA, and respondents' isolated DNA claims are invalid. *Chakrabarty*, 447 U.S. at 310.

The need to "isolate" a natural substance in order to study or exploit it is hardly unique to DNA. Many natural products—coal beneath the earth, cotton fibers mixed with cotton seeds, the stigmas of the saffron flower—must be physically separated, *i.e.*, "isolated," from their environments before becoming useful to mankind. Similarly, many highly reactive elements on the periodic table, such as lithium, boron, and barium,

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[8] DNA sequencing technologies rely on first isolating and breaking down DNA into segments shorter than—and thus potentially contained within—the claimed BRCA segments. See, *e.g.*, Thomas Kepler et al., *Metastasizing patent claims on BRCA1*, 95 Genomics 312-314 (2010).

[9] Anyone who isolates either BRCA gene, or any fragment thereof that is at least 15 nucleotides long, would infringe one or more of respondents' claims. See Pet. App. 426a.

occur in nature only in chemical compounds. The isolation of lithium and other elemental metals marked significant scientific achievements. Under Section 101 and its statutory predecessors, however, the isolation of such substances from their natural environments has not been viewed as the "invention" of a new patent-eligible "manufacture" or "composition of matter." Indeed, courts in the early part of the 20th century repeatedly rejected claims for isolated natural elements as new "manufacture[s]."[10] See, *e.g.*, *General Elec. Co.* v. *De Forest Radio Co.*, 28 F.2d 641, 642-643 (3d Cir. 1928), cert. denied, 278 U.S. 656 (1929); *In re Marden*, 47 F.2d 957 (C.C.P.A. 1931).

c. Respondents have argued (Resps. C.A. Br. 36-40), and the concurring judge below agreed (Pet. App. 76a-78a), that isolated DNA is patent-eligible as a "purified" natural substance. They rely on early lower-court decisions upholding patents on natural compounds that have been so refined and purified through human intervention as to become a substance different "in kind" from the natural product. See, *e.g.*, *Kuehmsted* v. *Farbenfabriken of Elberfeld Co.*, 179 F. 701 (7th Cir. 1910) (purified aspirin had "therapeutically different" properties from impure substance), cert. denied, 220 U.S. 622 (1911); *Parke-Davis & Co.* v. *H.K. Mulford Co.*, 189 F. 95, 103 (S.D.N.Y. 1911), aff'd in part and rev'd in

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[10] The court of appeals viewed isolated elements as distinguishable from isolated DNA because isolated elements reflect "a simple separation from extraneous materials," Pet. App. 59a, and represent "basic building block[s] provided by nature," *id.* at 90a n.7 (Moore, J., concurring). But the isolation of elements, like the isolation of DNA, merely reflects the modifications inherent in removing the relevant natural substance from its environment. In neither context does the fact of isolation create a new patent-eligible substance.

part, 196 F. 496 (2d Cir. 1912); see also *In re Merz*, 97 F.2d 599 (C.C.P.A. 1938).

Those decisions indicate that certain purification processes—*i.e.*, processes that involve human manipulation of a substance that has been removed in impure form from its natural environment—may sometimes result in an altered substance that has structural features and/or operative properties that render the product markedly different from the impure substance that occurs in nature. For instance, cDNA could be thought of as a "purified" gene, as it incorporates into a single contiguous, synthetic molecule only the coding regions of the naturally occurring gene. But isolated DNA reflects no such transformation. As explained above, isolated DNA has simply been removed from its natural environment within the human body, with minor structural changes that have no effect on its intrinsic properties, so that those properties may be observed and exploited in a laboratory setting. To label the process of removing DNA from a cell "purification," and to hold the culled DNA segments patent-eligible on that ground, would "make patent eligibility depend simply on the draftsman's art," without reference to the nature and extent of the underlying transformation, or the consequences for the public's ability to use the underlying substance. See *Mayo*, 132 S. Ct. at 1294 (citation and internal quotation marks omitted).

2. Neither the PTO's practice of issuing patents for isolated DNA, nor Congress's failure to overturn that practice, provides a sufficient reason to hold that isolated DNA is patent-eligible

a. Respondents argued below, and the concurring judge agreed, that Congress's failure to amend the Patent Act implies congressional endorsement of the

PTO's practice of granting patents for isolated DNA molecules. Pet. App. 86a-94a (Moore, J., concurring). Since the 1980s, the PTO has issued patents on isolated DNA, as well as on patent-eligible genetic materials such as cDNAs.[11] *Id.* at 87a-88a. As a general matter, however, the agency has historically viewed isolation standing alone as an insufficient basis for finding modified natural substances to be patent-eligible. See, *e.g.*, *Ex parte Latimer*, 1889 Dec. Comm'r Patent 123, 127 (1889) (fiber extracted from pine-tree needles "can no more be the subject of a patent in its natural state when freed from its surroundings than wheat which has been cut by a reaper"); see also *Ex parte Berkman*, 90 U.S.P.Q. 398, 401 (1951).

After the Federal Circuit's predecessor court issued decisions that could be read to support the patent-eligibility of natural substances removed from their environment, see *In re Bergstrom*, 427 F.2d 1394, 1401 (C.C.P.A. 1970); *In re Bergy*, 596 F.2d 952 (C.C.P.A. 1979), vacated in part, 444 U.S. 1028 (1980), and this Court held the modified organism in *Chakrabarty* to be patent-eligible, the PTO began to issue patents on isolated DNA. In 2001, the PTO issued its first written explanation of that practice. In response to comments concerning proposed revisions to its Utility Examination Guidelines, 66 Fed. Reg. 1092 (Jan. 5, 2001), the PTO stated that an isolated DNA molecule is not a product of nature "because that DNA molecule does not occur in

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[11] Given the different terminology used in different patents, it is difficult to estimate the number of patents issued for isolated DNA. The court of appeals stated that approximately 2645 "patents claiming 'isolated DNA'" have been issued. Pet. App. 61a-62a. There are many thousands of patents on cDNAs and other synthetic materials. *Ibid.*

that isolated form in nature." *Id.* at 1093. The PTO's revised Utility Examination Guidelines themselves did not have the force of law, *id.* at 1098, and they did not specifically address patents on DNA. The purpose of soliciting public comments, moreover, was not to consider whether to begin granting isolated DNA patents, or even to consider whether to continue that practice, but instead to consider the standard for determining utility generally. See 64 Fed. Reg. 71,441 (Dec. 21, 1999).

b. In these circumstances, Congress's failure to enact legislation abrogating the PTO's practice of issuing isolated DNA patents does not give rise to any inference of congressional endorsement of the PTO's interpretation. Unlike in *J.E.M. Ag Supply*, in which this Court inferred that Congress had approved the PTO's practice of granting plant utility patents, here the PTO did not begin issuing isolated DNA patents after any "highly visible" formal administrative action that thoroughly explained the agency's interpretation of the statute. 534 U.S. at 145. And because the correctness of the PTO's practice was never challenged in litigation prior to this case, there was no extant judicial decision applying Section 101 to isolated DNA patents.

Moreover, although bills relating to patents on genetic materials have occasionally been introduced in Congress, there is little "evidence that Congress considered * * * the *precise* issue presented before the Court." *Rapanos* v. *United States*, 547 U.S. 715, 750 (2006) (plurality opinion) (citation omitted). Most of the proposed bills addressed the general policy implications of patents on all types of genetic materials, including synthesized materials. See Genomic Science and Technology Innovation Act of 2002, H.R. 3966, 107th Cong., 2d Sess. (2002); Genomic Research and Diagnostic Accessibility

Act of 2002, H.R. 3967, 107th Cong., 2d Sess. (2002); Life Patenting Moratorium Act of 1993, S. 387, 103d Cong., 1st Sess. (1993); see also Consolidated Appropriations Act, 2004, Pub. L. No. 108-199, § 634, 118 Stat. 101 (prohibiting use of funds to issue patents on "human organism[s]"). Although one bill would have prohibited patents on "nucleotide sequence[s]," it was never brought to a vote, and its application to isolated DNA molecules (as opposed to the information contained in nucleotide sequences) is not clear from its text. See Genomic Research and Accessibility Act, H.R. 977, 110th Cong., 1st Sess. (2007). Because "Congress takes no governmental action except by legislation," and bills can be proposed and rejected for any number of reasons, none of these bills raises any inference that Congress approved the PTO's practice of granting patents on isolated DNA. *Rapanos*, 547 U.S. at 750; *Solid Waste Agency* v. *U.S. Army Corps of Eng'rs*, 531 U.S. 159, 169-170 (2001); cf. *J.E.M. Ag Supply*, 534 U.S. at 145 (relying on Congress's enactment of legislation reflecting the premise that plants could be patented).

c. The court of appeals' decision also reflected the related concern that invalidating patents on isolated DNA would unduly disturb the "settled expectations" of biotechnology patent holders and investors. See Pet. App. 61a-62a (citation omitted); *id.* at 88a (Moore, J., concurring). The patent laws are designed to promote the development of new and useful inventions, and to encourage the dissemination of knowledge that enables others to replicate those inventions, by offering as a reward a promise of exclusivity to those who satisfy the statutory requirements. The PTO's known practice of issuing patents for isolated DNA molecules therefore

could reasonably be expected to increase the incentives for genomic research.

A patentee's legitimate expectations, however, are always tempered by the possibility that a court could subsequently disagree with the PTO and hold that the patent is invalid under Section 101 or other provisions of the Patent Act. See, *e.g.*, *Mayo*, 132 S. Ct. at 1304-1305 (invalidating diagnostic-method patent despite industry's reliance interests); Pet. App. 119a (Bryson, J., dissenting) ("There is no collective right of adverse possession to intellectual property."). And while the PTO's practice of issuing patents for isolated DNA is relatively longstanding, no court had ever specifically upheld the patent-eligibility of isolated DNA until the court of appeals ruled in this case. The reliance interests at stake here therefore are not comparable to those to which the Court gave weight in *Festo Corp.* v. *Shoketsu Kinzoku Kogyo Kabushiki Co.*, 535 U.S. 722, 739 (2002), and *Warner-Jenkinson Co.* v. *Hilton Davis Chemical Co.*, 520 U.S. 17, 41 (1997) (Ginsburg, J., concurring), in which the Court considered the scope and contours of the judicially-created principles of prosecution-history estoppel and the doctrine of equivalents. In those cases, the "settled expectations of the inventing community" were entitled to particular solicitude because those expectations arose from the longstanding judicial decisions that had initially created the relevant doctrines. See *Festo*, 535 U.S. at 739. Reversal of the court of appeals' judgment with respect to isolated DNA would not disturb any analogous body of judicial precedent.

3. Field-specific concerns about encouraging innovation do not justify treating isolated DNA as patent-eligible

The court of appeals' holding that isolated DNA is patent-eligible rested in part on the court's desire to avoid the "adverse effects on innovation that a holding of ineligibility might cause." Pet. App. 62a; *id*. at 60a-61a; *id*. at 95a (Moore, J., concurring). But although encouraging innovation is an underlying purpose of the patent system, the desire to encourage innovation in a particular field cannot render patent-eligible products that are not the result of human invention. The prospect of patent protection for isolated genomic DNA has undoubtedly encouraged valuable discoveries. By the same token, however, patent protection would create additional incentives to discover many difficult-to-obtain but clearly patent-ineligible products of nature, such as previously unknown mineral ores or plants growing in the wild. Cf. *Funk Brothers*, 333 U.S. at 130. As this Court explained in *Mayo*, natural phenomena are not patentable "even though rewarding with patents those who discover new laws of nature and the like might well encourage their discovery." 132 S. Ct. at 1301.

The court of appeals suggested that the product-of-nature exception to Section 101 should be given a particularly narrow construction in the biotechnology context because "the biotechnology industry * * * depends on patents to survive." Pet. App. 95a (Moore, J., concurring); see *id*. at 44a, 59a-60a. Biotechnology researchers will have ample freedom to patent their inventions, however, even if isolated DNA is treated as patent-ineligible. As a general matter, when researchers manipulate and alter natural substances to create new products that are not found in nature (as in the creation

of cDNA), patent-eligibility depends on the degree to which the purported invention differs from its naturally-occurring antecedent. There is no evident reason to assume that the standard applied to other industries is unsuited to the biotechnology field. And even though isolated but otherwise unmodified DNA segments are not patent-eligible, novel methods of identifying, isolating, and using DNA molecules—and other products of nature—may be patented, as may any new and useful alteration of those molecules through human intervention.

In any event, this Court has traditionally eschewed the sort of industry-specific calculus that the court below appeared to endorse. In *Mayo*, for example, the Court stated that policy arguments about the need for financial incentives in a particular industry are generally not an appropriate consideration in determining the scope of Section 101. See 132 S. Ct. at 1304-1305. This Court's analysis of patent-eligibility under Section 101 reflects an effort to strike an overall balance between encouraging innovation through the promise of exclusivity and preventing unduly broad and preemptive monopolies. See *id.* at 1294, 1305. Because the "general rules" that result from that balancing "must govern inventive activity in many different fields of human endeavor, * * * the practical effects of rules that reflect a general effort to balance these considerations may differ from one field to another." *Id.* at 1305. While "recogniz[ing] the role of Congress in "crafting more finely tailored rules where necessary," the Court has therefore "hesitate[d] before departing from established general legal rules lest a new protective rule that seems to suit the needs of one field produce unforeseen results in another." *Ibid.*

Although the incentives created by the patent laws have spawned enormous public benefits, the product-of-nature exception serves important public purposes as well. The judicially-created exceptions to Section 101 reflect this Court's understanding that "[p]atent protection is, after all, a two-edged sword." *Mayo*, 132 S. Ct. at 1305. The promise of exclusivity that can foster innovation can also "impede the flow of information that might permit, indeed spur, invention," by "raising the price of using * * * patented" products or preventing others from using them at all. *Ibid.* In particular, an overbroad conception of patent-eligibility under Section 101 can impose significant social costs by requiring the public to pay to study and exploit that which ought to be "free to all men and reserved exclusively to none." *Funk Brothers*, 333 U.S. at 130. As between the reliance interests of patent holders whose research efforts may have been prompted in part by the PTO's patenting standards, and the public interest in avoiding undue restrictions imposed by patents that effectively preempt natural laws and substances, the interest of the public has consistently been given precedence. See *Mayo*, 132 S. Ct. at 1294 (Court's precedents "warn us against upholding patents that claim processes that too broadly preempt the use of a natural law"); *Mercoid Corp.* v. *Mid-Continent Inv. Co.*, 320 U.S. 661, 665 (1944) (in the patent system, "the public interest * * * is dominant").

CONCLUSION

The judgment of the court of appeals should be affirmed insofar as it holds that cDNA is patent-eligible, and reversed insofar as it holds that isolated but otherwise unmodified DNA is patent-eligible.

Respectfully submitted.

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